

REMARKS

Claims 91-94 are now pending in this application. Claims 87, 89 and 90 are cancelled herein. Claims 1-86 and 88 are previously cancelled. New claims 91-94 are added.

Applicants herein traverse and respectfully request reconsideration of the rejection of the claims cited in the above-referenced Office Action.

Claims 87, 89 and 90 are now cancelled rendering the rejections moot. However, insofar as the subject matter of new claims 91-94 which are substituted therefor reflects that of the cancelled claims 87, 89 and 90, and in the event the Examiner considers asserting the present rejection against the new claims, applicants submit the following remarks.

The invention according to newly added claim 91, in addition to reciting the aging treatment, adds the following recitations:

heating the metal body up to a temperature for
performing solution heat treatment of the metal body
thus forming a low deformation resistance region;

deforming the metal body at the low
deformation resistance region by twisting, and
quenching the metal body thus forming a non-low

deformation resistance region and turning the metal structure of the metal body into finer grain structure.

While it is possible to allow the metal body to contain a relatively large amount of addition elements in a solid solution state simply by heating the metal body to a solid solution temperature and then by quenching the metal body, as compared to a metal body in a constitutional diagram, according to the present invention called for in claim 91, by adding the step of deforming the metal body by twisting in the solution heat treatment and by performing quenching the metal body along with deformation of the metal body, an amount of addition elements which the metal body can contain in a solid solution state can be remarkably increased.

Further, according to the present invention of claim 91, the metal body has a metal structure thereof turned into a finer grain structure by twisting while being subjected to the solution heat treatment, and hence, it is possible to form the metal body with micro metal structure and with a larger amount of addition elements in solid solution than the composition in a constitutional diagram. In the conventional manufacturing method, a metal body with micro metal structure while being subjected to the solution heat treatment cannot be manufactured due to the growth of the metal structure attributed to the heating during the solution heat treatment. In contrast, such metal body can be manufactured using the processing method of the present invention.

The invention according to newly added claim 92, in addition to reciting the previously included aging treatment, adds the following recitations:

heating the metal body up to a temperature for performing solution heat treatment of the metal body thus forming a first low deformation resistance region;

deforming the metal body at the first low deformation resistance region by twisting, and quenching the metal forming a non-low deformation resistance region where the metal structure of the metal body is turned into finer grain structure and an amount of addition elements placed in solid solution is increased;

heating the metal body at the non-low deformation resistance region up to a temperature at which the recrystallization of metal structure is generated in the metal body thus forming a second low deformation region, the temperature for forming the second low deformation region being lower than the temperature forming the first low deformation resistance region;

deforming the metal body at the second low deformation resistance region by twisting and Quenching the metal body thus turning the metal structure of the metal body into further finer grain structure.

According to the present invention of claim 92, in a manner analogous to the present invention according to claim 91, by adding the step of deforming the metal body by twisting in the solution heat treatment and by performing quenching the metal body along with deformation of the metal body, an amount of addition elements which the metal body can contain in a solid solution state can be remarkably increased.

Further, according to the recited subject matter of claim 92, by suppressing the heating temperature for forming the second low deformation resistance region to a temperature at which the recrystallization of the metal structure is generated in the metal body, it is possible to suppress the growing of the metal structure, so that the metal structure can be made further finer by deformation twisting.

The invention as further defined in dependent claim 93 is additionally distinguished over the prior art in that the metal body is heated before heating the metal body up to a temperature for performing solution heat treatment of the metal body for forming the first low deformation resistance region. Accordingly, the first

low deformation resistance region, which is heated at a relatively high temperature, can be heated uniformly within a short time. Then, by applying deformation by twisting to the low deformation resistance region which is uniformly heated, it is possible to make the metal structure homogeneous and fine.

Newly added dependent claim 94 includes the qualification that the temperature of the preheating is set to the solution heat treatment temperature. By setting the temperature of the preheating to the solution heat treatment temperature, it is possible to perform heating for a necessary and sufficient time for solution heat treatment, and hence, it is possible to deform the metal body which is surely subjected to the solution heat treatment by twisting, thus making the metal structure fine.

In the final Office Action of August 3, 2010, the Examiner states that claims 87 and 90 are rejected as being unpatentable over Nakamura (JP 2001-321825 with machine translation English translation, JP '825) in view of Rosales et al (US 3,794,528).

In the Office Action, the examiner states that JP '825 is applied to claims 87 and 90 for the same reason as stated in the previous Office Action mailed February 18, 2010. In that previous non-final Office Action, the Examiner avers that "JP '825 teaches rotation forge may be used for the process (paragraph [0028] of JP '825), which reads on the limitation of shearing including imparting rotation motion which allows the rotation of one non-low deformation resistance region relative to

the another non-relative deformation resistance region.” However, applicants respectfully disagree with the Examiner’s interpretation of this paragraph. Applicants respectfully submit that, contrary to the Examiner’s analysis, paragraph [0028] of JP ‘825 merely states that the diameter of rod material 2 can be decreased by roller forging where the axis of rotation of the roller is perpendicular to the axis of the rod material 2. Consequently, this paragraph [0028] of JP ‘825 neither discloses nor suggests a deformation by twisting of the rod material 2 about an axis of the rod material 2. Accordingly, it is applicants’ position that JP ‘825 is, in fact, silent regarding the claimed technical feature of the present invention requiring “deforming the metal body at the low deformation resistance region by twisting.”

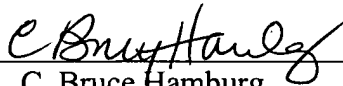
The same is true for the secondary Rosales et al. reference cited by the Examiner, which is similarly devoid of disclosure which teaches or suggests the technical feature of the present invention directed to “deforming the metal body at the low deformation resistance region by twisting,” which feature is recited in both independent claims 91 and 92. Thus, the proffered combination could not be properly applied to either of newly added claims 91 and 92 in basing a rejection as obvious over this art.

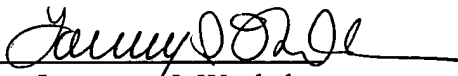
Based upon the foregoing, favorable action on the merits is earnestly solicited.

A Request for Continued Examination (RCE) is being filed concurrently herewith in which applicants request a one (1) month extension.

In light of the foregoing, the application is now believed to be in proper form
for allowance of all claims and notice to that effect is earnestly solicited.

Respectfully submitted,
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